



September 19, 2002

Nooksack River Water Quality and Portage Bay Shellfish



OVERVIEW

Monitoring data demonstrates significant improvement of a serious water quality problem has been achieved following the development and implementation of a Total Maximum Daily Load (TMDL). This positive change occurred within a surprisingly short time period and, if this trend continues, use of an important tribal resource could be restored next year. This marked reduction in bacterial contamination could only have been accomplished through the collaborative efforts of the Lummi Nation, Washington State Dept. of Ecology (Ecology), Washington State Dept. of Health (DOH), United States Environmental Protection Agency (EPA), Portage Bay Shellfish Protection District (Whatcom



Harvesting oysters at a Lummi Bay oyster bed.

County), Whatcom Conservation District, United States Natural Resources Conservation Service (NRCS), members of the Whatcom County Chapter of the Washington State Dairy Federation, and participation of concerned citizens. "Success" of this effort

will have been achieved when water quality targets established for the Lower Nooksack River Basin Bacteria TMDL are met and the Portage Bay shellfish beds are re-opened and maintained in an "Approved" classification status.

ABSTRACT

? Portage Bay shellfish are an important cultural, subsistence, recreational and commercial resource for the members of the Lummi Nation. Although water quality problems in the Nooksack River had

been known for years, coordinated actions to correct the problems really only began following the 1996 partial closure of Portage Bay on the Lummi Indian Reservation to commercial shellfish harvesting.

? The trends toward better water quality have been achieved through the collaborative efforts of many participants, each contributing to the extent of their respective charters. Examples

(Continued on page 2)

ABSTRACT

(Continued from page 1)

include improved regulatory oversight of potential pollution sources in the Nooksack River watershed, provision of technical and financial resources to dairy operators, and improved and sustained water quality monitoring.

- ? The trend toward better management of animal wastes in the Nooksack River started in 1997 when EPA Region 10 initiated its confined animal feeding operation (CAFO) inspection/enforcement initiative. The lesson learned – *routine inspections and enforcement for noncompliance*

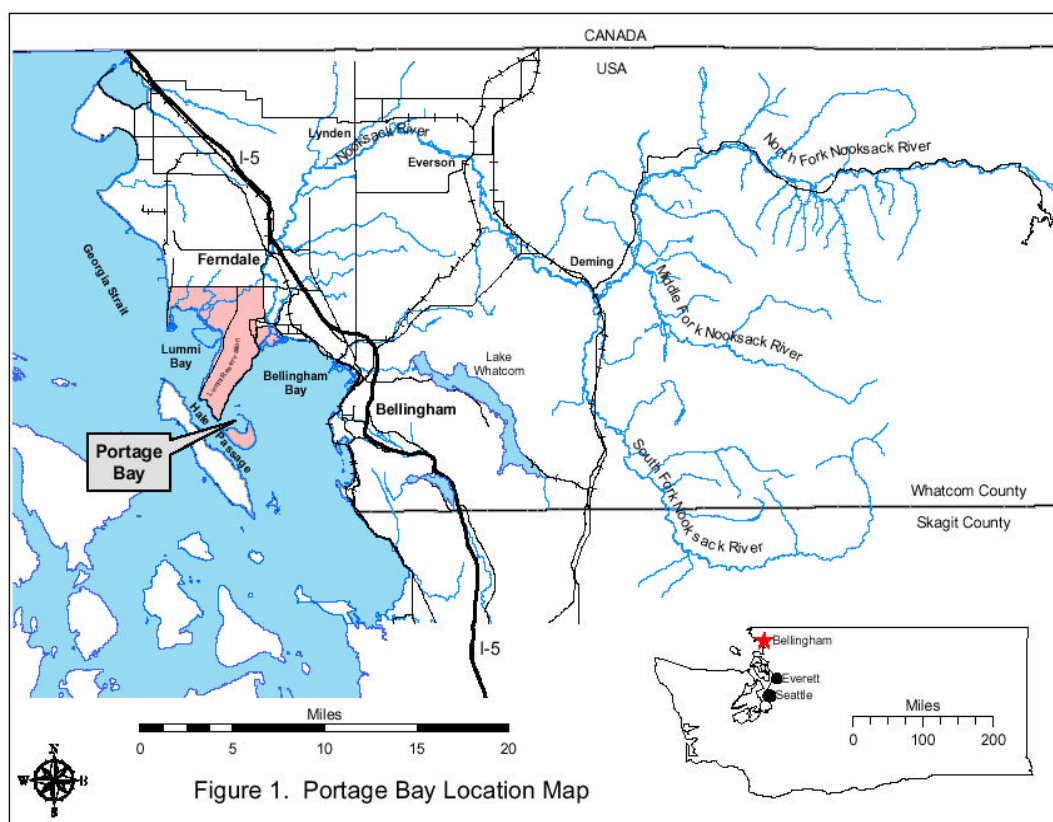
ance are critical components of an effective CAFO regulatory program.

- ? The Lower Nooksack River Basin Bacteria TMDL was an invaluable tool to those working to eliminate bacterial contamination to the Nooksack River. The TMDL identified clear targets for guiding pollutant cleanup activities and provided the implementation plan around which the collaborative effort was formed.
- ? The significant improvement of Nooksack River water quality demonstrates that indi-

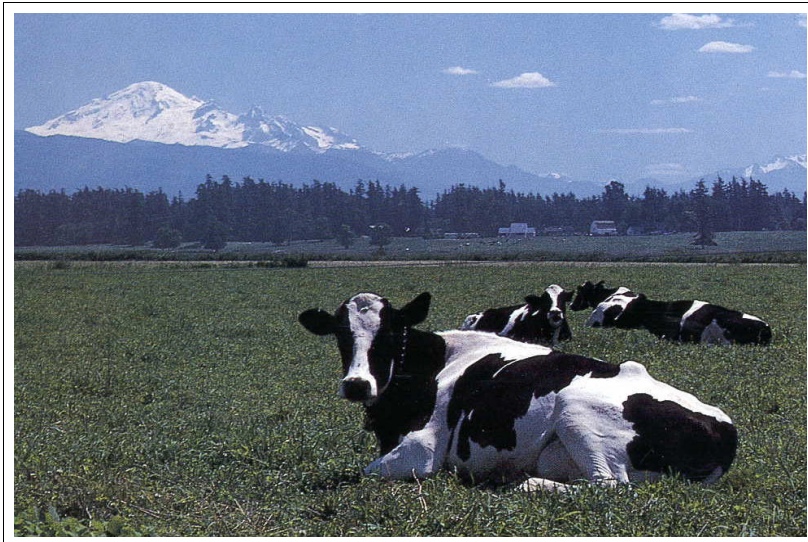
vidual, site-specific *farm plans* are an effective tool to address both water quality concerns and landowner objectives. The farm plan approach works best when all the farms identified as potentially contributing to the problem are required to implement a plan designed for their current operation.

- ? Water quality monitoring in the watershed has proven to be an indispensable tool for tracking changes in water quality, determining the effectiveness of control measures, and identifying sources of pollutant loading.

The lesson learned—routine inspections and enforcement for noncompliance are critical components of an effective CAFO regulatory program.



BACKGROUND



Cows relaxing in the pasture of a Whatcom County dairy farm. When properly managed, farm practices are not detrimental to maintaining high water quality, and can actually provide environmental benefits.

Portage Bay is located in the western portion of Bellingham Bay and is part of the Lummi Indian Reservation (see Figure 1). Water quality of the Nooksack River affects Portage Bay because of Portage Bay's close proximity to the mouth of the river and the circulation of water within Bellingham Bay. Fecal coliform transported down the Nooksack River can flow over the shellfish beds in Portage Bay.

Fecal coliform bacteria are associated with wastes from warm-blooded animals, such as livestock, wildlife and humans. The presence of fecal coliform bacteria is an indicator of the potential presence of pathogenic organisms that are also a threat to human health. The National Shellfish Sanitation Program (NSSP) water quality standards for an "Approved" classification in commercial shellfish beds is

a fecal coliform geometric mean of not greater than 14 fecal Coliform forming units per 100 milliliters (14 CFU/100 ml) and an estimate of the 90th percentile not greater than 43 CFU/100 ml. Fecal coliform densities measured in 1997 and 1998 near the mouth of the Nooksack River showed greater than 10% of the samples exceeded 200 CFU/100 ml with several samples in excess of 800 CFU/100 ml.

In December 1996, the Lummi Nation voluntarily closed a 60-acre portion of Portage Bay to commercial shellfish harvest. This closure was done at the request of DOH, because fecal coliform densities were found to be exceeding the NSSP water quality standards. In August 1997, this area was formally downgraded by DOH from "Approved" to "Restricted". In August 1998 the Lummi Nation

voluntarily closed an additional 120-acres when an analysis of the DOH water quality data indicated that the NSSP standards were no longer being met at other sample stations. By the middle of 1999, additional sampling stations in the Approved areas were being threatened with a downgrade because of increasingly poor water quality.

Shellfish are an important resource to the Lummi Nation as they are harvested by tribal members for commercial, subsistence, cultural and recreational purposes. The Lummis estimate a loss of approximately \$250,000 per year in commercial income alone as the result of the initial 60-acre closure of Portage Bay shellfish beds. This loss does not include the value associated with subsistence and cultural use of this resource by the Lummis.

The significant improvement of Nooksack River water quality demonstrates that individual, site-specific farm plans are an effective tool to address both water quality concerns and landowner objectives.

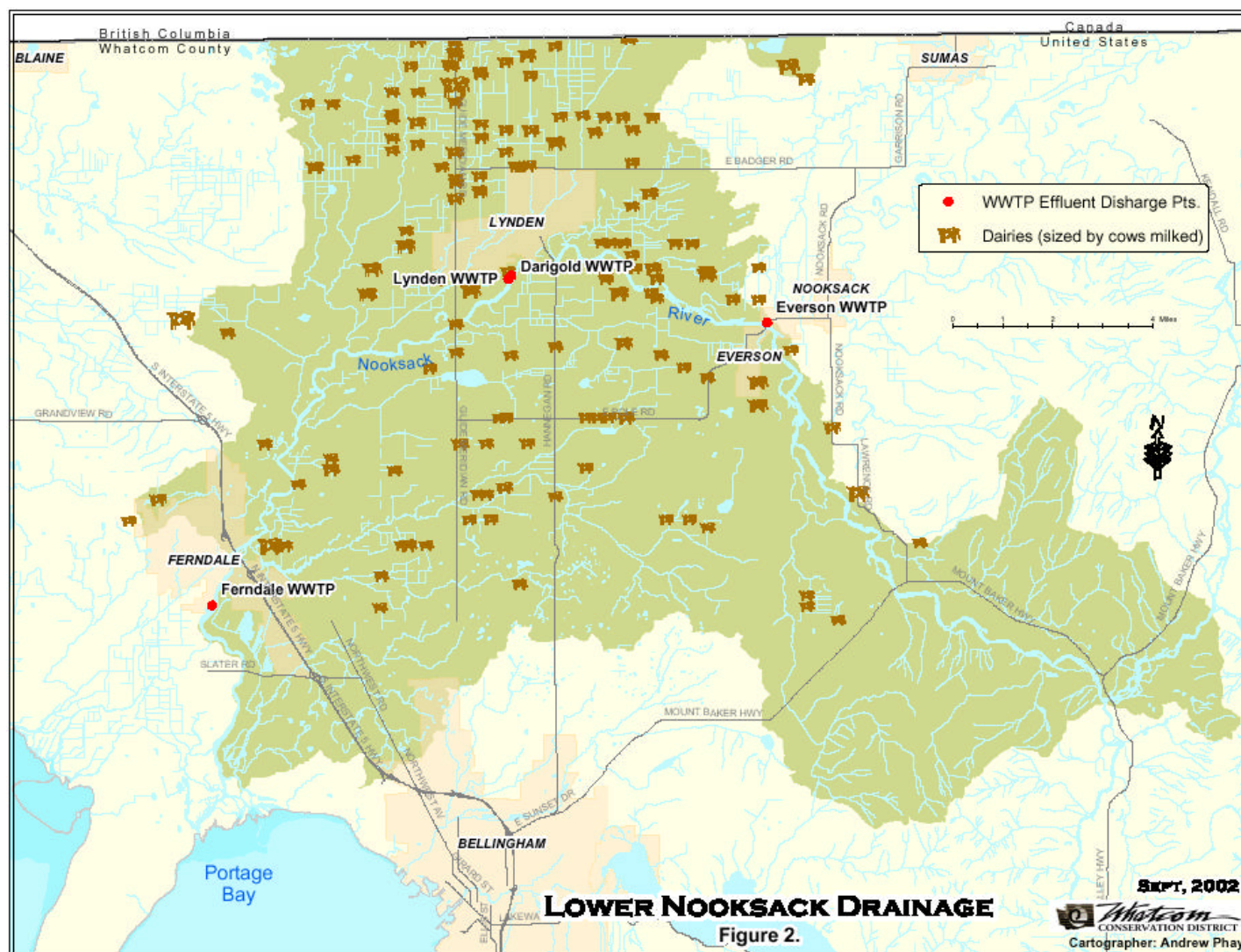
POLLUTANT SOURCES

Monitoring in the Nooksack River watershed confirmed that the largest sources of bacteria loading were dairies and municipal wastewater treatment plants (WWTPs). Figure 2 shows the location of dairies and WWTPs in this watershed. There are over 37,000 milking cows on about 122 dairy operations in this watershed. This total does not include beef live-stock operations or dairy replacement cows. To put these numbers into environmental perspective, one cow excretes the equivalent of about 20 humans each day. The typical dairy operation of 300 cows generates about as much waste as a city of 6,000 people. At

the time of the 1996 shellfish bed downgrades, regulation of the dairy industry by Ecology was solely a complaint-driven response program. Dairy operations found by Ecology staff to be discharging wastes were referred to the local conservation district to obtain technical and financial assistance to resolve the problem(s). Formal enforcement by the state against illegal discharges was uncommon and many operations were referred repeatedly by Ecology over a period of years.

Evaluation of the municipal wastewater treatment plants that discharge to the Nooksack

River also determined the need to provide better and more reliable treatment to remove fecal coliform. The National Pollutant Discharge Elimination System (NPDES) permits, which regulate these discharges, were modified by Ecology to implement wasteload allocations of the TMDL. Construction of treatment plant upgrades by some of the municipalities is currently underway. Other contributions of fecal coliform from noncommercial animal keeping activities and runoff from failing septic systems are identified through the Nooksack tributary monitoring efforts and addressed by Ecology and/or Whatcom County staff.



REGULATION OF DAIRY WASTES

At the time of the initial shellfish bed closure in Portage Bay in 1996, the prospects for reversing the downward trend in water quality seemed dim. The magnitude of the pollution in the Nooksack River and in waters near other dairy areas of the state were clear indicators that the complaint-driven response used in Washington State was ineffective at controlling discharges from dairy operations. After discussions with Ecology, the Lummi petitioned the EPA in the fall of 1996 for assistance in restoring and protecting their shellfish resources. Trust responsibilities to help the tribe and other factors prompted EPA to act on long held concerns about the inadequacy of the state's regulation of CAFOs. Information about water quality near dairy areas in Idaho and Oregon also indicated that the problems attributable to animal waste mismanagement were widespread and significant.

Following public workshops to describe the problem and planned actions, EPA began inspections in the winter of 1997. These inspections were targeted at Whatcom County dairy operations suspected of discharging animal wastes to surface waters. During February, March, and April of 1997 EPA inspected 57 dairy operations in the county. Of these inspected operations, 42 were issued warning letters notifying the operators about observed problems with animal waste management. Formal enforcement actions including significant monetary penalties were



This manure storage lagoon on a Whatcom County dairy farm was built to hold manure through the rainy season to avoid runoff to streams leading to shellfish beds.

initiated against 6 operators. Six operations of the 57 were notified that they appeared to be implementing good waste management practices. EPA conducted additional inspections during 1998 and 1999 and expanded the program to neighboring Skagit, Snohomish, King, and Pierce counties. EPA also expanded this initiative into Idaho and Oregon not only to address water quality problems in these adjoining states, but also to ensure that the regulatory playing field for this industry was level between states.

Within two years of EPA's inspection initiative, the Washington State Legislature passed the Dairy Nutrient Management Act (RCW 90.64). With this legislation Ecology began implementing a new state program for regulating the dairy industry. No longer complaint driven, inspectors began a regular inspection regime charged with identifying existing and potential animal waste discharge problems. An underlying premise of the new program is that operators who have invested resources and time into properly managing the

wastes (nutrients) generated by their animals are not put at an economic disadvantage. The following important elements are required by the Dairy Nutrient Management Act to address water quality problems associated with animal waste discharges and to provide the desired 'level playing field' for operators in the state's dairy industry:

- ? Routine compliance inspections by Ecology staff,
- ? Timely and appropriate enforcement response to documented non-compliance,
- ? Dairy operators develop and implement dairy nutrient management plans (farm plans) by 2003.

Since 1998 Ecology has maintained two staff in its Bellingham Field Office to conduct inspections of dairies in Whatcom County. Each dairy has been visited about three times since inception of the new dairy program. Since 1998, informal enforcement to eliminate potential pollution sources has been pursued 86 times. Formal enforcement, which has occurred 29 times, is initiated by issuing a Notice of Violation when an illegal discharge is documented. The Notice of Violation has been followed by issuance of 20 administrative orders, 12 penalty actions, and an additional 13 dairies are being regulated through an NPDES permit. About 10 percent of the dairies in Whatcom County are now regulated under an NPDES permit program.

An underlying premise of the new program is that operators who have invested resources and time into properly managing the wastes (nutrients) generated by their animals are not put at an economic disadvantage.

Over 50,000 acres in Whatcom County are now being managed under farm plans requiring 3,000 acres of vegetative practices to protect watercourses from surface runoff of sediment, nutrients, and bacteria.

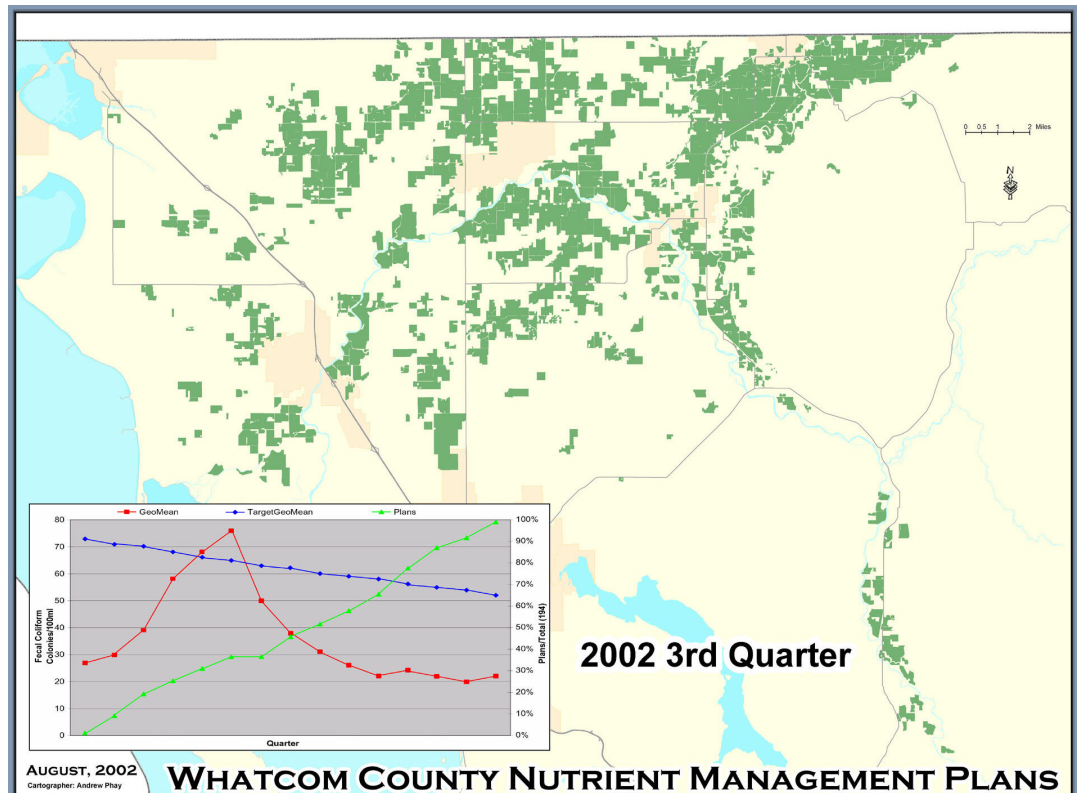


Figure 3. Map of farm plans recently designed and implemented within Whatcom County.

FARM PLANS

Farm plans provide detailed expectations as to what is appropriate and necessary nutrient management conduct for a particular farm/operation. Ecology and EPA inspectors documented no significant water quality problems at operations that were fully implementing farm plans developed pursuant to NRCS technical guidance. As a growing number of dairy operators implement farm plans this field observation about the effectiveness of farm plans to protect water quality has since been reinforced by significant improvement to water quality. Prior to the dairy legislation only a handful of dairy operators had fully implemented farm plans in Whatcom County even though technical and financial assistance had

been available for many years. Within three weeks of EPA's first inspections in Whatcom County, the Conservation District reported a backlog of over 80 producers asking for plans.

Since EPA and Ecology inspections began and the subsequent state dairy program was established, Whatcom Conservation District and NRCS staff has developed farm plans for 204 (99.5%) Whatcom County dairy operations. Over 50,000 acres in Whatcom County are now being managed under farm plans requiring 3,000 acres of vegetative practices to protect watercourses from surface runoff of sediment, nutrients, and bacteria. As shown in Figure 3, the improved water quality in the

Nooksack River corresponds with implementation of farm plans over the past four years by the local dairy industry.

The ongoing Agriculture, Fish and Water initiative in Washington is developing a farm plan-based approach for addressing both Clean Water Act and Endangered Species Act requirements. There is good reason to believe the success of farm plans in the Nooksack River watershed can be reproduced in other agricultural areas if broadly applied across the landscape.

TMDL

In addition to inspections and enforcement against discharging dairy operations, Ecology began development of a Total Maximum Daily Load (TMDL) for fecal coliform in the lower Nooksack River watershed. A TMDL is essentially a water quality restoration plan that determines the amount of pollutants a water body can assimilate without exceeding water quality standards. The TMDL allocates that load among sources in a conservative manner such that water quality standards will be met with a margin of safety when the allocations are achieved. Ecology solicited involvement and input from all interested and affected parties

(stakeholders) in developing the TMDL. This inclusive public participation process allowed Ecology to prepare an implementation strategy that identified a variety of actions necessary to achieve TMDL pollutant reduction targets.

Development of the Lower Nooksack River Basin Bacteria TMDL required collection of considerable monitoring data to determine the sources of pollutant loading. Monitoring in the watershed documented that fecal coliform concentrations in the Nooksack River increased significantly in the lower watershed where the dairy operations are located. The monitoring data showed that the agricultural

areas of the lower Nooksack River basin contributed only 11 percent of the flow in the Nooksack River but accounted for 73 percent of the fecal coliform loading. The TMDL analyses determined reductions for direct discharges into the Nooksack River and for the Nooksack River tributaries necessary to meet state water quality standards and the NSSP criteria for shellfish harvesting in marine waters. Interim water quality goals established on a quarterly schedule were set in the TMDL implementation strategy. The interim water quality goals have been invaluable in focusing ongoing implementation efforts.

SHELLFISH PROTECTION DISTRICT

In response to the downgrades of the shellfish beds, DOH initiated meetings to find local sponsors and participants to develop a Shellfish Closure Response Plan for Portage Bay. The Whatcom Conservation District volunteered to be the lead in developing a shellfish recovery plan. This closure response plan was completed

January 2000 through the participation and effort of many interested individuals, the Lummi Nation, various agency staff and members of the local dairy industry. The final recovery plan includes comprehensive information about the watershed, water quality monitoring data, and lists activities needed to restore and protect

water quality and shellfish resources. The implementation activities identified shellfish resources. The implementation activities identified in the Shellfish Response Plan provided a basis for developing the *summary implementation strategy* (SIS) for the Lower Nooksack River Basin Bacteria TMDL.

Monitoring of the Nooksack River and its tributaries provided critical information for developing the TMDL, identifying sources of pollutant discharges and determining the efficacy of implementation activities.

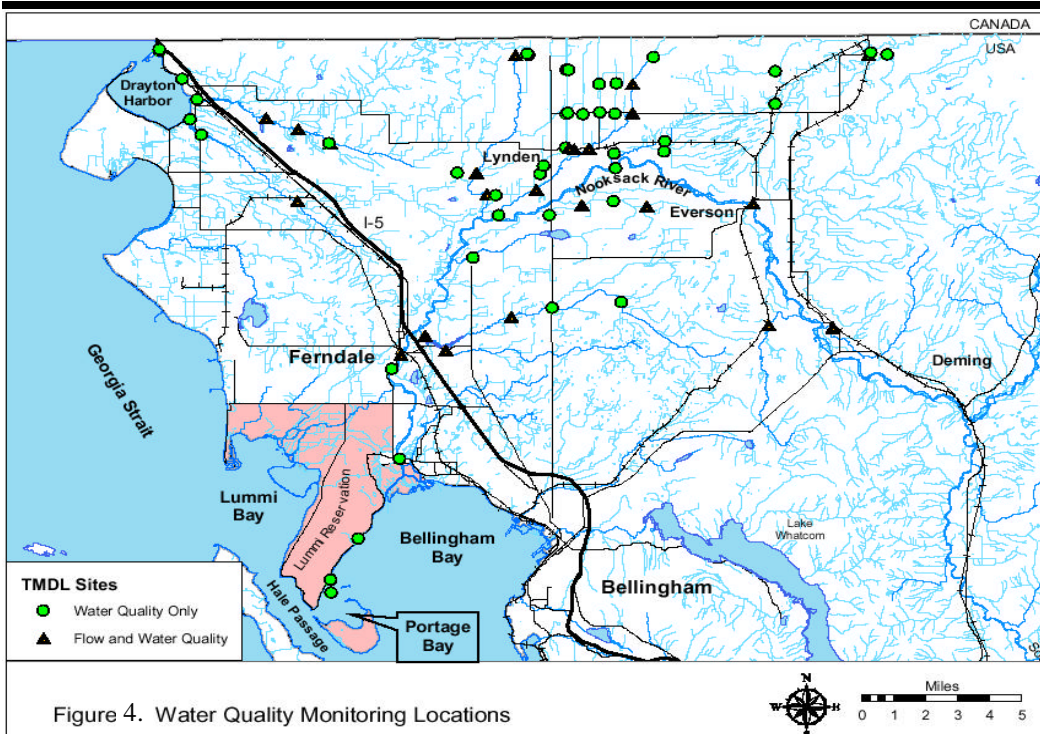


Figure 4. Water Quality Monitoring Locations

WATER QUALITY MONITORING

There have been three primary water quality monitoring efforts initiated in response to the Portage Bay shellfish closure that supplement on-going water quality monitoring conducted by the Lummi and Ecology. The three additional monitoring efforts focused on 1) the Nooksack River watershed, 2) the shoreline areas near Portage Bay on the Lummi Reservation, and 3) a dye study of the Gooseberry Point Wastewater Treatment Plant outfall operated by the Lummi Nation.

Monitoring of the Nooksack River and its tributaries provided critical information for developing the TMDL, identifying sources of pollutant discharges and determining the efficacy of implementation activities. Figure 5 presents monitoring data and a trend line showing the declining fecal coliform densities near the mouth of the Nooksack River.

Except for the monitoring conducted by Ecology to develop the TMDL, most of the ongoing monitoring in the watershed is being conducted under state and federal grants to the Whatcom Conservation District, the Lummi Nation, and the Northwest Indian College (NWIC). Ecology and EPA provided funds that have been used by the Lummi Natural Resources Department and the NWIC to collect and analyze semi-monthly (two samples per month) water quality samples. Figure 4 shows the extensive network of monitoring locations where sampling has been conducted in the Nooksack River lowland areas since November 1998. State and federal funding is also being used to conduct stream flow measurements at 20 of the water quality sampling sites so that fecal coliform loading can be evaluated. The current TMDL Im-

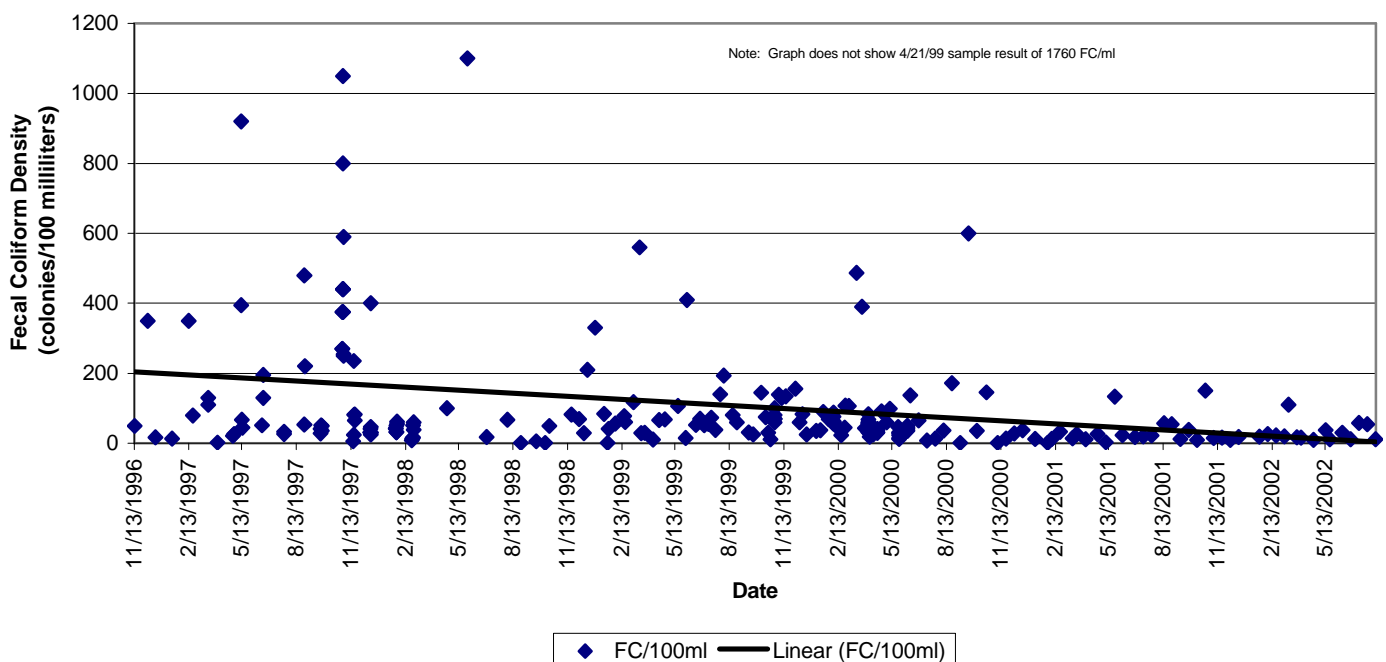
plementation Monitoring Program is funded through March 2004.

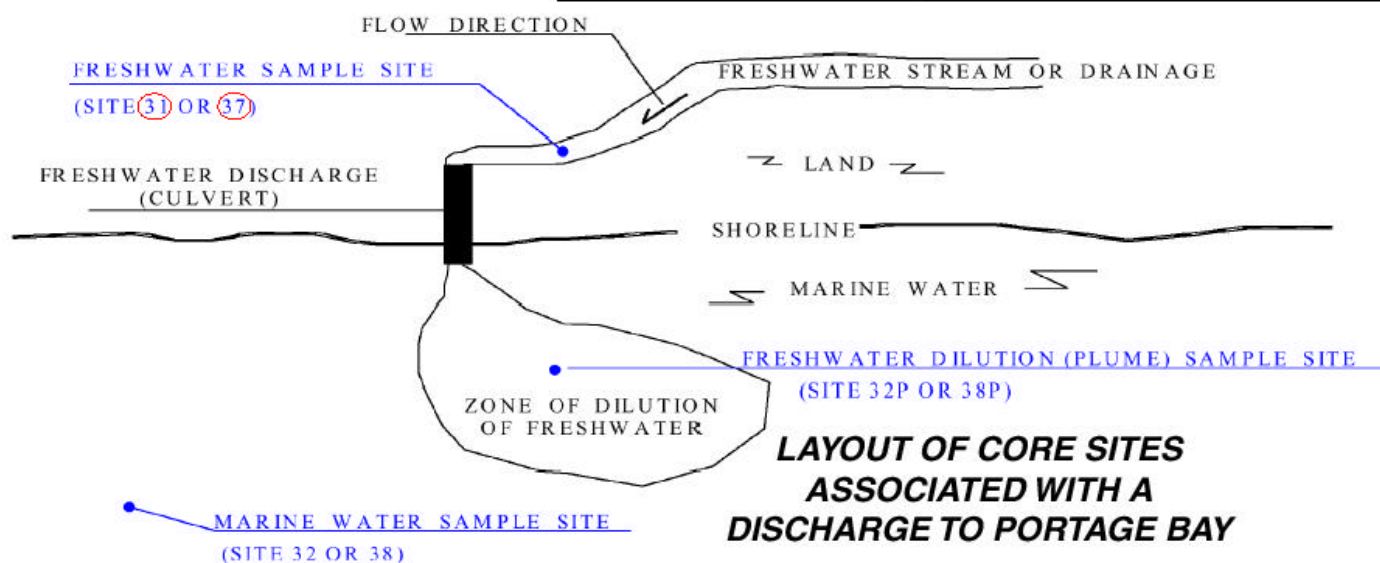
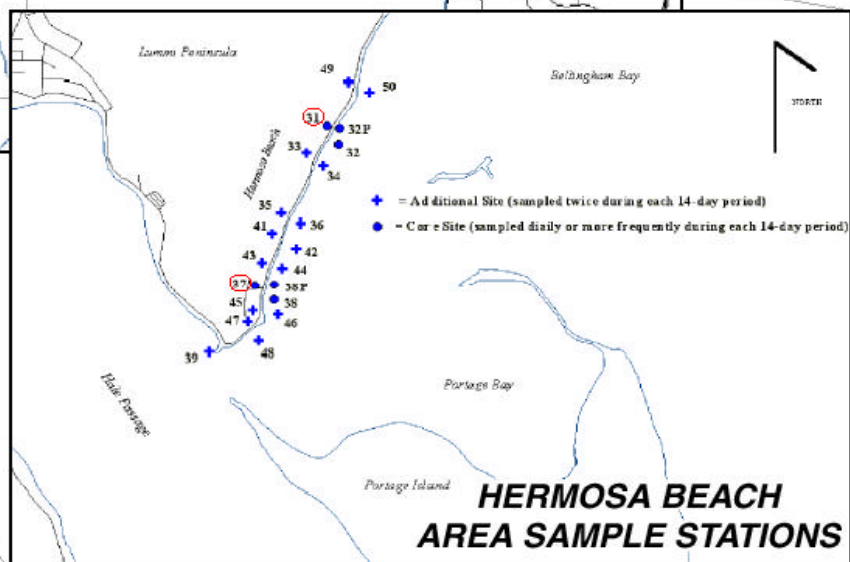
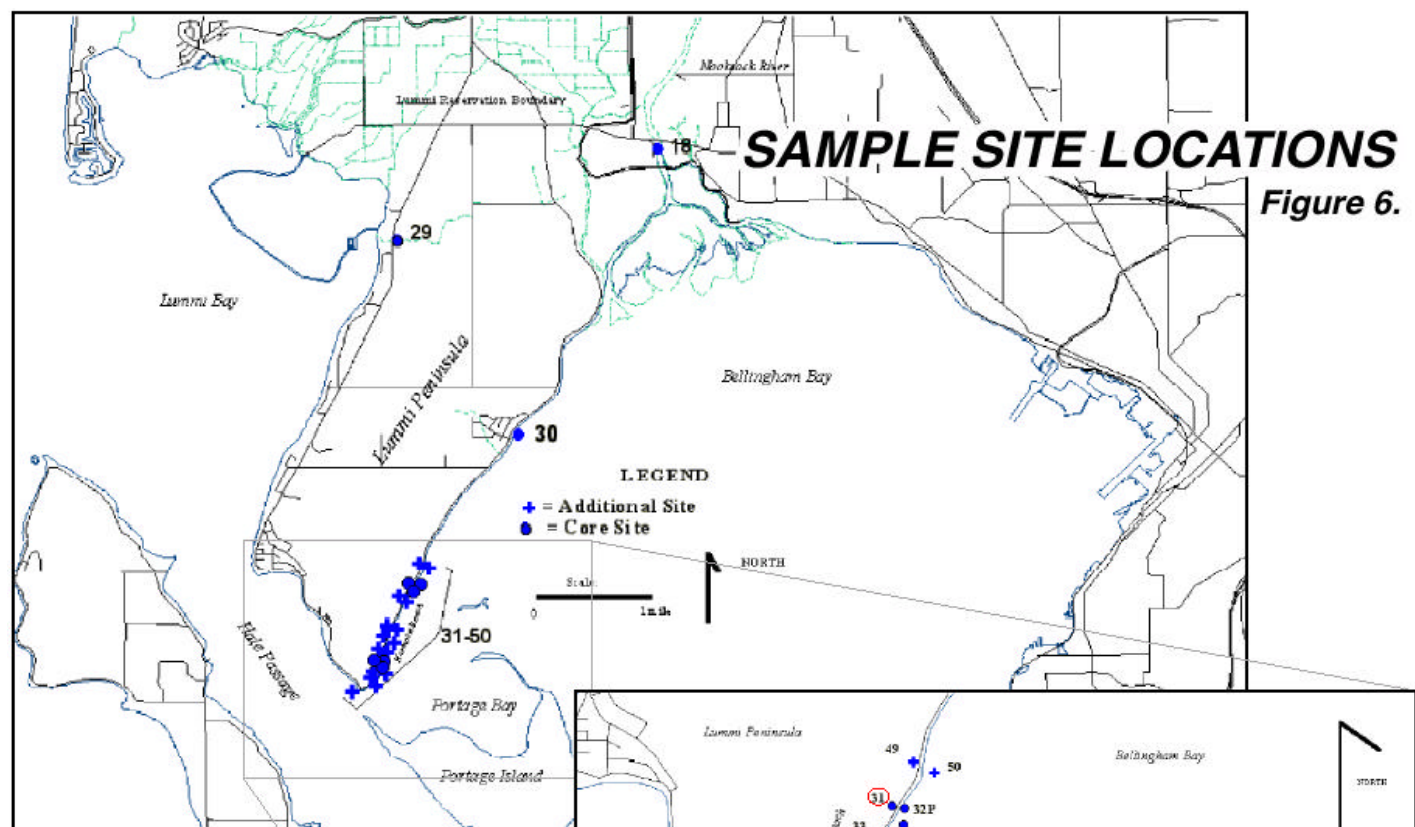
Additional water quality monitoring of the shoreline areas around Portage Bay was initiated by the Lummi Nation with EPA funding in order to determine if there are local sources of fecal coliform that contributed to the down grade. The three-year study provided a combination of spatially extensive sampling (i.e., samples collected over a wide area over a short time interval) and temporally intensive sampling (i.e., samples collected at a few sites over a few days to a week) around Portage Bay (Figure 6). The water quality sampling evaluated initial flush conditions and "baseflow" conditions. Results indicated that although there were some elevated fecal coliform levels encountered in a few of the samples, the discharge of this contaminated

water was very small and the associated loading was also very small. Overall, the conclusion is that the elevated fecal coliform and low salinity levels in Portage Bay could not be attributed to local sources.

The Lummi Nation, EPA, and the Washington Department of Health (DOH) cooperatively conducted a dye study of the Gooseberry Point Wastewater Treatment Plant outfall in 2001 to confirm a 1985 hydrographic study of shellfish growing waters of Hale Passage/Portage Bay. The 1985 study concluded that it is unlikely that effluent from the Gooseberry Point Wastewater Treatment Plant would have much impact on shellfish growing areas in Portage Bay. The more detailed drogue and dye studies conducted during 2001 during adverse receiving water conditions had results similar to the 1985 study – effluent from the wastewater treatment plant does not flow into Portage Bay.

Figure 5. Fecal Coliform Densities in the Nooksack River at the Marine Drive Bridge (Sample Station Maritetta Bridge [M1])





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CURRENT STATUS

As dairy compliance inspections, enforcement actions, and implementation of farm plans began to take effect, water quality in the

the Nooksack River is suspected. Unless the source of this fecal coliform loading is identified and addressed, any upgrade of the shellfish beds



A DOE inspector taking a water quality sample.

Nooksack River and critical tributaries began to improve. The fecal coliform densities in the marine waters over the shellfish beds have followed the same improving trend as the river water quality. At the end of July 2002, only one sampling station of the four in the Restricted area remained out of compliance with the NSSP water quality standards. With twice-monthly sampling and continued good water quality in Portage Bay, the prospects for an upgrade in the near future were bright. The geometric mean for the Marine Drive site based on the last 30 samples is 27 FC/100 ml. This station has been below the TMDL target geometric mean of 39 FC/100 ml since the summer of 2000. Unfortunately, high counts of fecal coliform were measured at all four sample stations in the restricted area during the mid-August water quality sampling effort. The cause of these high numbers has not yet been identified, but a short-term loading event in

will be delayed by approximately one year.

Before a classification upgrade for the Restricted area of Portage Bay can be considered by DOH, three events have to happen. First and foremost, results from the sampling stations must come into compliance with the NSSP water quality standards. Second, DOH has to see documentation of pollution sources in the watershed that have been discovered and repaired. Third, DOH needs solid assurances that pollution control and monitoring programs will remain in place so that the Approved classification can be maintained into the foreseeable future. It is critically important that once the currently restricted shellfish beds are reopened that they stay opened. Experience has shown that continued enforcement, monitoring, and farm plan implementation will be required to maintain an Approved classification of the Portage Bay shellfish beds.